

P21550

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

09/926475

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

INTERNATIONAL APPLICATION NO.

PCT/DK00/00252

INTERNATIONAL FILING DATE

12 May 2000

PRIORITY DATE CLAIMED

12 May 1999

TITLE OF INVENTION

FOOD COMPOSITIONS WITH HIGH SOLIDS CONTENT, A METHOD FOR ITS PREPARATION AS WELL AS THE USE OF CARRAGEENANS FOR GELLING A FOOD COMPOSITION

APPLICANT(S) FOR DO/EO/US

Torben JØNSSON, Jeanette KRISTENSEN and Jan GRØNDAL

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ☒ This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371
3. ☒ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☒ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371 (c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau)
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3))
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
"UNEXECUTED"
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (U.S.C. 371(c)(5)).

Items 11 to 16 below concern other document(s) or information included:

11. Assignee: _____
12. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
13. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
14. ☒ A FIRST preliminary amendment
☐ A SECOND or SUBSEQUENT preliminary amendment
15. ☐ A substitute specification
16. ☐ A change of power of attorney and/or address letter.
17. ☒ Figure of Drawing to be published 1,1
18. ☒ Other items or information.

International Application as published
PCT/RO/101 PCT Request with International Application as filed.
Modified Application
Replacement Sheets 22-33 and 35-38, 7-11, 15 and 34.
Copy of Reply with Amended pages filed 4 May 2001 (with pages 7-42)
Copy of Letter dated August 02, 2001 with Amended Pages.
PCT/IPEA/416
PCT/IPEA/409 International Preliminary Examination Report
PCT/IB/332.
PCT/IPEA/408 Written Opinion.
PCT/IPEA/429
PCT/ISA/210.
PCT/IB/304.
PCT/IB/308.
PCT/IPEA/401 Chapter II Demand.
Claim of Priority.

09/17 Rec'd PTO 09 NOV 2001

U.S. APPLICATION NO. (If known, see 37 CFR 1.51) 09/926475		INTERNATIONAL APPLICATION NO. PCT/DK00/00252		ATTORNEY'S DOCKET NUMBER P21550	
19. <u>X</u> The following fees are submitted: Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search report has been prepared by the EPO or JPO \$ 890.00 International preliminary examination fee paid to USPTO (37 CFR 1.482). \$ 710.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO(37 CFR 1.445(a)(2)). \$ 740.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO. \$1,040.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4). \$ 100.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				CALCULATIONS	PTO USE ONLY
Surcharge of \$130.00 for furnishing the oath or declaration later than ____ 20 ____ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$ 0.00	
Claims	Number Filed	Number Extra	RATE	\$ 0.00	
Total Claims	26 - 20 =	6	X \$18.00	\$ 108.00	
Independent Claims	2 - 3 =	0	X \$84.00	\$ 0.00	
Multiple dependent claim(s) (if applicable)			+ \$280.00	\$ 0.00	
TOTAL OF ABOVE CALCULATIONS =				\$ 998.00	
<u> </u> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$ 0.00	
SUBTOTAL =				998.00	
Processing fee of \$130.00 for furnishing the English translation later than ____ 20 ____ 30 months from the earliest claimed priority date (37 CFR 1.492(f))				0.00	
Extension of Time fee in the amount of \$				0.00	
TOTAL NATIONAL FEE =				998.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				0.00	
TOTAL FEES ENCLOSED =				998.00	
				Amount to be refunded	\$
				Charged	\$
a. <u>X</u> A check in the amount of \$ <u>998.00</u> to cover the above fees is enclosed.					
b. <u> </u> Please charge my Deposit Account No. <u> </u> in the amount of \$ <u> </u> to cover the above fees.					
c. <u>X</u> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>19-0089</u> .					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO CUSTOMER NO. 7055 AT THE PRESENT ADDRESS OF					
Arnold Turk GREENBLUM & BERNSTEIN, P.L.C. 1941 Roland Clarke Place Reston, VA 20191 (703) 716-1191					
SIGNATURE Arnold Turk NAME <u>33,094</u> REGISTRATION NUMBER					

09/92647

JC17 Rec'd PCT/PTO 09 NOV 2

P21550.A01

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Torben JONSSON et al.
Appl. No : Not Yet Assigned
(National Phase of PCT/DK00/00252)
I.A. Filed : May 12, 2000
For : FOOD COMPOSITIONS WITH HIGH SOLIDS
CONTENT, A METHOD FOR ITS PREPARATION AS
WELL AS THE USE OF CARRAGEENANS FOR
GELLING A FOOD COMPOSITION

**PRELIMINARY AMENDMENT AND COVER LETTER
SUBMITTING AMENDED PAGES OF APPLICATION**

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

Enclosed please find substitute sheets of the above-identified application upon which the International Preliminary Examination Report was established. In particular, Applicants submit herewith replacement sheets of description and claims upon which the International Preliminary Examination Report is based. Specifically, Applicants submit herewith replacement sheets of description 22-33 and 35-38 received on May 7, 2001 and replacement sheets of description 7-11, 15 and 34 submitted by telefax on August 2, 2001; and replacement sheets 39-42 containing replacement claims 1-26 submitted by telefax on August 2, 2001.

Further, for the convenience of the Examiner, Applicants are submitting herewith a copy of the application including the replacement sheets, which has been labeled "MODIFIED APPLICATION".

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Based on the above, Applicants respectfully request examination on the merits of the application including replacement the replacement sheets of description and claims.

Additionally, prior to the examination of the above-identified modified application, entry of the following amendment is respectfully requested.

IN THE CLAIMS

Please amend claims 1, 8 and 22-25 as follows, with a marked-up copy of the amended claims being included in an Appendix attached hereto.

1. (Amended) A food composition comprising soluble solids in the range of about 50% to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE (Dextrose Equivalent) of at least about 30, a carrageenan component in an amount sufficient to form a gel, and water to balance, and wherein the gelation temperature, determined as the intersection of the graphs of elastic modulus, G' , and viscous modulus, G'' , measured on a Haake Rheometer, RS 100 using settings - Gradient $1^{\circ}\text{C}/\text{min}$, 0,4640 Hz, 95°C - 65°C , $t=1800$ s, 0,50 Pa, 65°C - 35°C , $t=1800$ s, 2,50 Pa, of said food composition is $<95^{\circ}\text{C}$.

8. (Amended) The composition according to claim 1, wherein the ratio of sucrose to non sucrose sweetener is from about 10:90 to about 70:30, preferably from about 20:80 to about 30:70, particularly preferred about 1:2.

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22. (Amended) The process according to claim 20, wherein the temperature sufficient to disperse the carrageenan in the syrup of the non sucrose sweetener is at least about 50, especially at least about 60°C.

23. (Amended) The process according to claim 20, wherein one or more ingredients selected among milk solids, vitamins, minerals, food grade acids, flavourings, colourings, artificial sweeteners, preservatives and bulking agents is (are) added between steps (c) and (d).

24. (Amended) The process according to claim 20, wherein in step (d) said hot mixture is deposited in moulds.

25. (Amended) A use of a carrageenan component for gelling a food composition of a soluble solids content of about 50% to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE of at least about 30, and wherein the gelation temperature of said food composition, determined as the intersection of the graphs of elastic modulus, G' , and viscous modulus, G'' , measured on a Haake Rheometer, RS 100 using the settings - Gradient 1°C/min, 0,4640 Hz, 95°C-65°C, $t=1800$ s, 0,50 Pa, 65°C-35°C, $t=1800$ s, 2,50 Pa, is <95°C.

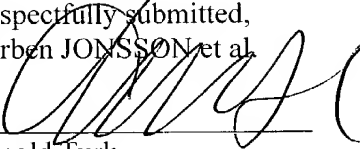
REMARKS

Entry of the foregoing replacement sheets and amendment of the replacement claims to remove multiple claim dependency and to include the changes to claims 1 and 25 in the International Preliminary Examination Report is respectfully requested.

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Should there be any questions, the Examiner is invited to contact the undersigned at the below listed number.

Respectfully submitted,
Torben JONSSON et al.



Arnold Turk
Reg. No. 33,094

November 9, 2001
GREENBLUM & BERNSTEIN, P.L.C.
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APPENDIX

1. (Amended) A food composition comprising soluble solids in the range of about 50% to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE (Dextrose Equivalent) of at least about 30, a carrageenan component in an amount sufficient to form a gel, and water to balance, and wherein the gelation temperature, determined as the intersection of the graphs of elastic modulus, G' , and viscous modulus, G'' , measured on a Haake Rheometer, RS 100 using settings - Gradient $1^{\circ}\text{C}/\text{min}$, 0,4640 Hz, 95°C - 65°C , $t=1800$ s, 0,50 Pa, 65°C - 35°C , $t=1800$ s, 2,50 Pa [- Stress sweep 35°C 0,10 Pa-20,00 Pa, 0,4640 Hz], of said food composition is $<95^{\circ}\text{C}$.

8. (Amended) The composition according to [any one of the claims 1 to 7] claim 1, wherein the ratio of sucrose to non sucrose sweetener is from about 10:90 to about 70:30, preferably from about 20:80 to about 30:70, particularly preferred about 1:2.

22. (Amended) The process according to [any one of the claims 20 to 21] claim 20, wherein the temperature sufficient to disperse the carrageenan in the syrup of the non sucrose sweetener is at least about 50°C , especially at least about 60°C .

23. (Amended) The process [of any one of the claims 20 to 22] according to claim 20, wherein one or more ingredients selected among milk solids, vitamins, minerals, food grade acids, flavourings, colourings, artificial sweeteners, preservatives and bulking agents is (are) added between steps (c) and (d).

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24. (Amended) The process according to [any one of the claims 20 to 23] claim 20, wherein in step (d) said hot mixture is deposited in moulds.

25. (Amended) A use of a carrageenan component for gelling a food composition of a soluble solids content of about 50% to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE of at least about 30, and wherein the gelation temperature of said food composition, determined as the intersection of the graphs of elastic modulus, G' , and viscous modulus, G'' , measured on a Haake Rheometer, RS 100 using the settings - Gradient $1^{\circ}\text{C}/\text{min}$, 0,4640 Hz, 95°C - 65°C , $t=1800$ s, 0,50 Pa, 65°C - 35°C , $t=1800$ s, 2,50 Pa [- Stress sweep 35°C 0,10 Pa-20,00 Pa, 0,4640 Hz], is $<95^{\circ}\text{C}$.

"MODIFIED APPLICATION"

09/926475

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Title

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Food Composition with High Solids Content. A Method for Its Preparation as well as the Use of Carrageenans for Gelling a Food Composition

Technical Field

- 5 This invention relates to a food composition having high solids content, a method for its preparation as well as the use of carrageenans for gelling a food composition. More particularly, this invention relates to confectionery products such as e.g. soft candies comprising as gelling agent one or more carrageenans, a method for the preparation thereof as well as the use of carrageenans for gelling a food composition.

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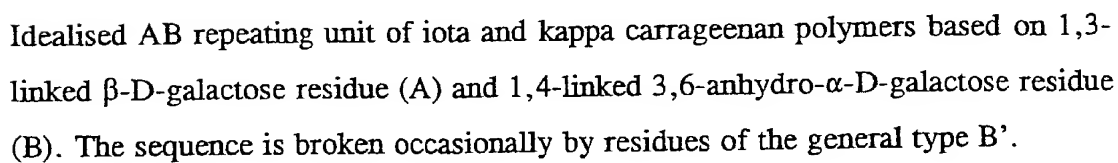
Background Art

- Food compositions having high solids content, such as confectionery products, e.g. soft candies or wine gum, are conventionally gelled by the use of gelatine, a heterogenous mixture of water-soluble high molecular weight proteins. Gelatine is
15 derived from collagen, usually by boiling animal hides or bones.

- Despite its excellent gelling capability, gelatine suffers from a number of drawbacks which can be attributed to its animal origin. Thus, gelatine is unacceptable to those of Muslim and Jewish faith, as it is often prepared from swine skin. Further, recently the use of gelatine in foods has been questioned due to the possible link between
20 consumption of foods containing gelatine of bovine origin and the occurrence of the Creutzfeldt-Jakob disease. Finally, the consumption of animals and animal-derived foods may be objectionable for some from an ethical point of view.

There is therefore a need for a vegetable alternative to gelatine.

A general formula for carageenan is disclosed by Nijenhuis, K. in *Advanced Polymer Science*, 130, 203-18, (1997):



Stortz, C.A. and Cerezo, A.S. describe in Carbohydrate Research, 145 (1986), 219-235, the different members of the carrageenan family by their idealised repeating units:

Carrageenan	3-linked residue	4-linked residue
Beta	Beta-D-galactopyranose 4-sulfate	3,6-anhydro-alpha-D-galactopyranose
Kappa	Beta-D-galactopyranose 4-sulfate	3,6-anhydro-alpha-D-galactopyranose
Iota	Beta-D-galactopyranose 4-sulfate	3,6-anhydro-alpha-D-galactopyranose 2-sulfate
Mu	Beta-D-galactopyranose 4-sulfate	Alpha-D-galactopyranose 6-sulfate
Nu	Beta-D-galactopyranose 4-sulfate	Alpha-D-galactopyranose 2,6-disulfate
Lambda	Beta-D-galactopyranose 2-sulfate (70%) and Beta-D-galactopyranose (30%)	Alpha-D-galactopyranose 2,6-disulfate
Theta	Beta-D-galactopyranose 2-sulfate	3,6-anhydro-alpha-D-galactopyranose-2-sulfate
Xi	Beta-D-galactopyranose 2-sulfate	Alpha-D-galactopyranose 2-sulfate

However, it is well-known to anyone skilled in the art that the solubility of carrageenans in systems of high soluble solids content is very limited, see e.g. "Carrageenan" by W.R. Thomas in Thickening and Gelling Agents for Food, Ed. A. Imeson, 1992, from which it appears that iota carrageenan is insoluble at soluble

solids contents of 50 % and above, whereas kappa carrageenan is only hot soluble at 50 % soluble solids (SS) content. Consequently, carrageenans have in the past mainly been used either in lower SS systems or in systems not requiring any gel formation.

US 5,631,034 discloses a method for preparing an aqueous sugar frosting mix comprising from about 70 to about 90 % by weight of sugar, from about 9 to about 29 % by weight of aqueous liquid and from about 0.05 to about 1.0 % by weight of a crystal growth inhibitor. Said crystal growth inhibitor may be a carrageenan. The purpose of the use of carrageenan in this system is to inhibit crystal growth of the sugar and to provide binding properties of the sprayable solution.

US 5,306,519 discloses a syrup composition having a sufficiently low viscosity so that it can be poured or pumped yet upon contact with a calcium containing confection its viscosity increases. Said syrup comprises from about 25 to about 60 % sugar solids, water, at least one sequestrant, and an amount of at least one calcium reactive gum sufficient to thicken the syrup upon contact with the calcium containing confection. Said calcium reactive gum may be a carrageenan which may be incorporated into the syrup at a level from about 0.05 to about 0.5 %, preferably from about 0.1 to 0.3 %.

WO 95/12985 discloses an injectable fondant and method of manufacturing same. Said injectable fondant presents in its cooled state, at least 0,5 day after manufacture, a solids content of 68 - 75 % by weight, including less than 1 % by weight of stabiliser. Said stabiliser may be a carrageenan.

US 5,607,716 discloses a low or no fat, water and sugar based high solid confection comprising at least 80 % to 90 % total solids by weight, wherein the carbohydrate content is at least 70 % by weight of the total solids, a cation containing edible material, a cation reactive and thermosensitive hydrocolloid, and up to 7 % by weight of fat, said confection having a water activity below 0.65 and a pH from 3.0

US 5,132,128 discloses a dessert topping having a pH greater than 4,6 and having a water activity of less than 0,84 and comprising a blend of carrageenan gum, a powdered cellulose bulking agent, a non-heat thinning cellulose gum bulking agent, high fructose corn syrups, an edible humectant and non-fat milk. The carrageenan gum may be used in an amount in the range of 0.75-1.75 % by weight of said topping, and the high fructose corn syrup is in the range of 50-60 % by weight of said topping. Said blend of carrageenan gum provides both gelling and viscosity control in order to obtain a suitable low viscosity upon heating while providing a viscous texture of the topping when placed on a dessert, particularly ice cream.

EP 0 366 248 A2 discloses preservative compositions for fruits and vegetables comprising antidiscolouration agent and edible thixotropic gum. A typical composition may contain 20-60% by weight of edible bulk filler (eg maltodextrin, preferably a low dextrose equivalent maltodextrin), 20-60 % ascorbic acid and 1-50 % edible thixotropic gum and 1-25 % natural or artificial flavouring. Thus, a thixotropic material is provided.

WO 98/20860 discloses a chewable composition for delivery of a pharmacologically active material to a user comprising sweetener, carrageenan and water, said composition comprising from about 50 to about 83 % of solids. Carrageenan may be present in an amount from about 2 % to 5,5 % and optionally one or more of an additional
5 hydrocolloid is present in a total amount of from about 0.5 % to about 2 % . Any suitable sweetener may be used.

EP 0 273 001 discloses a soft, sugarless, aerated confectionery comprising soluble solids in the form of hydrogenated starch hydrolysates in the range from 35 to 89 %
10 by weight and up to 5.5 % by weight of hydrocolloid such as a seaweed extract. The disclosed confectionery does not include any sugar and is deposited at temperatures of about 130 to 140° C.

US 5,603,979 discloses a method for the preparation of a fat-free peanutbutter like product comprising 15-40% by weight of water, 0.5 - 1.5 % by weight of natural
15 gum, 5-20% by weight of peanut flour, 20 - 35 % by weight of syrup and 5-13 % by weight of humectant. Carrageenan may be used as gum component. The product obtained must be spreadable.

Thus, as can be seen, the prior use of carrageenan has either been in lower soluble solids systems or in non-gelled end-products. Alternatively, the application of high
20 operating temperatures have been required. It has hitherto not been possible to disperse efficiently a carrageenan in a high solids system at a temperature of below 100° C at atmospheric pressure in order to form a gelled end-product, in which said carrageenan provides the main gel structure and texture.

Brief Description of the Invention

25 The object of the present invention is thus to provide a gelled food composition having high soluble solids content wherein said composition has an adequate low

viscosity during depositing in e.g. moulds, gels rapidly and can successfully be produced at temperatures not requiring special apparatuses or arrangements to be met.

In its first aspect, the present invention relates to a food composition comprising soluble solids in the range of 50% to 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE (Dextrose Equivalent) of at least about 30 a carrageenan component in an amount sufficient to form a gel, and water to balance, wherein the gelation temperature, determined as the intersection of the graphs of elastic modulus, G' , and viscous modulus, G'' , of said composition is $<-95^{\circ}\text{C}$ measured on a Haake Rheometer, RS 100 using the settings: - Gradient $1^{\circ}\text{C}/\text{min}$, 0,4640 Hz, $95^{\circ}\text{C} - 65^{\circ}\text{C}$, $t=1800\text{ s}$, 0,50 Pa, $65^{\circ}\text{C} - 35^{\circ}\text{C}$, $t=1800\text{ s}$, 2,50 Pa - Stress sweep 35°C 0,10 Pa- 20,00 Pa, 0,4640 Hz.

The elastic modulus, G' , indicates the solid behaviour of a gel, and is a measure of the gel strength, while the viscous modulus, G'' , indicates the liquid behaviour of the gel, which correlates to the degree of bounciness and trembling of the gel.

In a second aspect, the present invention provides a process for producing a food composition as defined above comprising (a) dispersing carrageenan in a syrup of a non sucrose sweetener at a temperature sufficient to disperse the carrageenan in said syrup while stirring, (b) adding water and heating the mixture to the boiling point thereof, (c) adjusting the soluble solids content to from about 50% to about 90% by weight, (d) depositing said mixture, and (e) cooling said mixture to below the depositing temperature of said mixture.

As used herein, the term "depositing temperature" means the lowest temperature, at which depositing is possible, i.e. at which temperature the food composition is still

flowable, such as through a "Mogul" plant or depositor.

In a third aspect, the present invention provides the use of a carrageenan component for gelling a food composition of a soluble solids content of about 50 to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising
5 sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE of at least about 30 and wherein the gelation temperature of said composition determined as the intersection of the graphs of elastic modulus, G' , and viscous modulus, G'' , measured on a Haake Rheometer, RS 100 using the settings - Gradient $1^{\circ}\text{C}/\text{min}$, 0,4640 Hz,
10 $95^{\circ}\text{C} - 65^{\circ}\text{C}$, $t=1800\text{ s}$, 0,50 Pa, $65^{\circ}\text{C} - 35^{\circ}\text{C}$, $t=1800\text{ s}$, 2,50 Pa - Stress sweep 35°C 0,10 Pa- 20,00 Pa, 0,4640 Hz, is $< 95^{\circ}\text{C}$.

Brief Description of the Drawing

The invention is described in more details with reference to the accompanying drawing, wherein

15 Figs 1.1 to 1.9 illustrate viscosity, elastic modulus, G' , and viscous modulus G'' , versus temperature for food compositions produced according to example 8, and

Fig 2 illustrates viscosity, elastic modulus, G' , and viscous modulus, G'' , versus temperature for food compositions I, II and VI according to Example 9.

Further scope of applicability of the present invention will become apparent from the
20 detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the scope of the invention will become apparent to those skilled in the art from this detailed description.

Best mode for carrying out the invention

The food composition according to the invention in a preferred embodiment comprises a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweetener of 0:100 to 95:5, wherein the non
5 sucrose sweetener is a hydrogenated-starch hydrolysate syrup of a DE of at least about 30, preferably a DE > 30 fructose or glucose syrup.

In a particularly preferred embodiment of the present invention, said non sucrose sweetener is a hydrogenated starch hydrolysate syrup with a DE of at least about 40,
preferably a DE > 40 fructose or glucose syrup.

10

As used herein, the term "DE" stands for "Dextrose Equivalent". DE indicates the degree to which a carbohydrate starting material has been decomposed to dextrose.

15

Thus, it has been found that at DE values below about 30, the carrageenan employed will swell excessively, leading to excessive gelling causing a gelation temperature well above 100° C. However, gelation temperatures of above 100° C are undesirable from a practical point of view, necessitating special precautions and requirements in terms of e.g. apparatus.

20

By employing the above mentioned sweetening system, it has, however, surprisingly been shown that it is possible to dissolve a carrageenan component in a high solids system of about 50 to about 90% by weight of soluble solids using a minor amount of water. A particular advantage of the present invention is thus the fact that the amount of water added can be limited compared to a conventional process whereby less energy is needed for the subsequent evaporation thereof to obtain a final product of a desired soluble solids content. The present invention thus represents a substan-
25 tially increased process efficiency.

In a preferred embodiment, the non sucrose sweetener is a hydrogenated starch hydrolysate syrup with a DE in the range of about 40 to about 100, particularly preferred about 50 to 90, especially about 60 to 70. A non sucrose sweetener with a maltose content $\geq 50\%$ and a DE of about 50 to 60 is particularly preferred. Said
5 embodiment provides the optimum characteristics in terms of sweetness level, texture and solubility of the gelled food composition.

In another embodiment of the present invention, the sucrose can be replaced wholly or partly by an aqueous solution of a sugar alcohol. Said sugar alcohol is preferably, but not exclusively, selected among sorbitol, mannitol, xylitol, isomalt, lactitol,
10 maltitol or a maltitol syrup.

In a preferred embodiment of the present invention, the sweetening system comprises sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweetener of from about 10:90 to about 70:30, preferably from about 20:80 to about 30:70, particularly preferred about 1:2. Thus, it has been found that at the disclosed
15 ratios, an acceptable sweetness level still providing a composition having a gelation temperature of $< 95^{\circ}\text{C}$ is obtained.

Particularly preferred, the gelation temperature of said food composition is $< 85^{\circ}\text{C}$, preferably $< 80^{\circ}\text{C}$.

The present invention is highly suitable for preparing gelled food compositions
20 having high soluble solids content. In a preferred embodiment, said soluble solids content is in the range of 70 to 85% by weight, particularly preferred about 75 to 80% by weight.

Advantageously, at least about 80%, preferably at least about 90% of the soluble solids are comprised by the above sweetening system. Thus, it has been shown that
25 even at such high concentrations of sweetening system a gelled product having a

satisfactory gelation temperature may be obtained.

As carrageenan component an iota carrageenan or a kappa carrageenan or mixtures thereof are employed, preferably in an amount of about 0.25 to 10.0% by weight, preferably about 0.75 to 5.0%, especially about 1 to 3% by weight of the food composition. Suitable carrageenans are commercially available as e.g. GENUTINE™ type X-8300, X-8302, and X-9303 from Hercules Copenhagen, Denmark, or GENU-
GEL™ type WR-713 or X-8605, likewise available from Hercules Copenhagen.

While the above carrageenans are the preferred ones, it must be understood that the invention is not limited thereto. Thus, any carrageenan component, which will provide the required gelling capability, may be employed in a food composition according to the present invention. More particularly, a carrageenan component in a non-purified form, such as in the form of seaweed, particularly red seaweeds, may also be employed.

Further, one or more additional hydrocolloids may be employed in combination with the above disclosed carrageenans to provide a particular gelling property, such as pectin, e.g. GENU™ Pectin, available from Hercules Copenhagen, agar-agar, e.g. GENU™ Agar, available from Hercules Copenhagen, cellulose, such as AVICEL™, cellulose extracts and derivatives such as carboxy methyl cellulose (CMC), e.g. Blanose cellulose gum, methyl cellulose, e.g. Benecel™, hydroxy propyl cellulose, e.g. Klucel, hydroxy propyl methyl cellulose and mixtures thereof, starch, such as Avebe™ Perfectagel MPT, Avebe™ Perfectagel 928 and Avebe™ Perfectamyl Gel MB, alginates, xanthans such as Keltrol or Kelgum from Kelco Biopolymers, curdlan, gelatine, guar, locust bean gum, tara gum, karaya gum, gellan gum such as Kelcogel from Kelco Biopolymers, furcellaran, tragacanth, and gum arabic, generally in an amount of up to about 10% by weight.

As further optional ingredients, conventional additives to obtain a desired, tasty food composition, may be added, such as conventional milk solids, vitamins, minerals, food grade acids and salts thereof, flavourings, colourings, artificial sweeteners, preservatives, bulking agents such as SimplesseTM from Kelco Biopolymers,
 5 isomaltose, trehalose, tagatose, erythritol and polydextrose

Suitable food grade acids comprise inter alia citric acid, fumaric acid, acetic acid, adipic acid, malic acid, ascorbic acid, tartaric acid, lactic acid, sorbic acid and mixtures thereof.

As flavourings may be employed any food grade flavourings desired for the particular purpose, such as fruit flavours, e.g. strawberry, raspberry, orange or lemon,
 10 vanilla, peppermint, wintergreen, cinnamon, eucalyptus, coffee, tea, liquorice, etc. Further food grade colourings may be added to obtain a desired appearance of the food composition.

Optionally, one or more artificial sweeteners may be employed in order to obtain a particular sweetness level, such as saccharin and salts thereof, cyclamate salts,
 15 acesulfame K, aspartame, alitame, neohesperidin DC, sucralose, stevioside, and thaumatin.

As preservatives any approved preservative may be used, such as benzoic acid, sorbic acid and salts and esters thereof.

It has been found that the above disclosed food composition allows obtention of a lowering of the gelation temperature of the food composition in question to less than 95° C. A lowering of the gelation temperature and, consequently, the depositing temperature represents a substantial improvement in the confectionery industry, since less complicated apparatuses and simpler and more cost effective production methods
 25 may be employed during manufacture.

The food composition according to the invention is in a preferred embodiment a high sugar confectionery, such as soft candies, also known as wine gums, gummy candies or chews. Thus, it has been shown that the present invention provides a food composition having a unique new texture resembling the chewiness conventionally obtained
5 by means of gelatine as gelling agent.

The food composition in another embodiment of the invention is an aerated confectionery and further comprises a whipping agent. Aerated confectioneries, such as marshmallows, can thus successfully be prepared by the present invention.

Further, the food composition according to the invention can take the form of glazings.
10

It must be appreciated, however, that the present invention is not limited to the above disclosed specific embodiments. On the contrary, the present invention may be employed to produce a variety of other high sugar confectioneries, such as leathers, angel kisses, chocolate containing candies, fillings, reversible glazings, heat stable
15 glazings, thixotropic glazings, nappages, lollypops, liqourice products, candy bars, jelly beans and pastils etc.

The present invention also provides a process for producing the food composition according to the invention by (a) dispersing carrageenan in a syrup of a non sucrose sweetener at a temperature sufficient to disperse the carrageenan in said syrup while
20 stirring, (b) adding water and heating the mixture to the boiling point thereof, (c) adjusting the soluble solids content to from about 50% to about 90% by weight, (d) depositing said mixture and (e) cooling said mixture to below the depositing temperature of said mixture. Any sucrose to be employed in order to obtain a desired sweetness level is added after heating the mixture to the boiling point thereof.

The food composition obtained through the above process is preferably deposited in moulds and left to stand for a few minutes up to about one hour. Thus, whereas prior art gelatine gelled confectioneries tend to adhere to moulds of plastics and metal and consequently have to be deposited in starch moulds and necessitates standing for up to a week in order to obtain a final texture, the food composition according to the invention gels instantaneously, can be deposited in any type of mould, such as metal and plastic moulds, and can be demoulded within minutes up to about one hour. The present invention thus allows a faster and more flexible production of gelled food compositions.

- 10 Any further ingredients of the food composition, such as food grade acids, flavourings, colourings, artificial sweeteners or preservatives are preferably added after adjustment of the soluble solids content in step (c). In the case of production of aerated confectioneries, a whipping agent is separately mixed with water and any icing or confectioner's sugar and beaten to a stiff foam before addition to the high solids composition.

While the above disclosed process is the preferred one, the present invention is not limited thereto. Thus, the food composition according to the invention may also be produced by a process, whereby carrageenan is dispersed in sucrose, if any, the dry mixture obtained is dissolved in water and heated, non sucrose sweetener and optionally any additional sucrose is added to the hot mixture, whereupon the soluble solids content is adjusted to the desired level. Finally, the product obtained is cooled to below the depositing temperature. The latter process is particularly useful in connection with the preparation of glazings.

Further, the food composition according to the invention may be prepared by dispersing carrageenan in water while heating, adding said dispersion to a hot sweetener solution, whereupon the soluble solids content is adjusted to the desired level and any additional ingredients are added.

The present invention also provides the use of a carrageenan component for gelling a food composition of a soluble solids content of about 50 to about 90 % by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 5 0:100 to 95:5, wherein the non sucrose sweetener is of a DE of at least about 30, and wherein the gelation temperature of said composition determined as the intersection of the graphs of elastic modulus, G' , and viscous modulus, G'' , measured on a Haake Rheometer, RS 100 using the settings - Gradient $1^{\circ}\text{C}/\text{min}$, 0,4640 Hz, $95^{\circ}\text{C} - 65^{\circ}\text{C}$, $t=1800\text{ s}$, 0,50 Pa, $65^{\circ}\text{C} - 35^{\circ}\text{C}$, $t=1800\text{ s}$, 2,50 Pa - Stress sweep 35°C 0,10 Pa- 10 20,00 Pa, 0,4640 Hz, is below 95°C . The carrageenan component is preferably an iota carrageenan or a kappa carrageenan or mixtures thereof.

Thus, a vegetable alternative to gelatine has been provided giving a product of a similar texture as gelatine gelled products and which allows the preparation of food compositions of high soluble solids content in a cost and energy efficient, industrially 15 applicable process.

Examples

In the examples given below the following apparatus and chemicals have been used to prepare and test food compositions according to the invention:

Apparatus:

- 20 • Texture Analyzer, TA-XT2. 5 kg. Software Texture ExpertTM, manufactured by Stable Micro Systems, England.

Chemicals:

- Sucrose, food grade, Danisco A/S, Denmark

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15 a

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- Citric acid, monohydrated, MERCK in 50% w/v solution
- Tri-sodium citrate, $2\text{H}_2\text{O}$, MERCK
- GENUTINE™ types X-8302, X-8300, and X-9303 carrageenan, Hercules

Copenhagen, Denmark

- GENUTM types WR-713 and X-8605 carrageenan, Hercules Copenhagen, Denmark
- GENUTM type 900-A1 Agar, Hercules Copenhagen, Denmark
- 5 • Glucose syrup (DE 39 to 42) 80 to 84 % SS, IGOS, Denmark
- High Iso Fructose FT-1750 (DE 95), Cerestar, Denmark
- High Maltose glucose syrup (DE 54), Cargill HM 70, 80 % SS, Cargill, The Netherlands
- Glucose HMF 70.9, 80 % SS, Cargill, The Netherlands
- 10 • Invert syrup (DE 95)
- Glucose syrup FT 01700 (DE 62 64), Cerestar, Denmark
- Maltitol syrup Lyasin 80/55, Roquette, Lille Cedex, France
- HyfoamaTM DSN whipping agent.

Example 1.1

- 15 • High Maltose glucose syrup (DE 54) Cargill HM 70, 80 % SS, Cargill, The Netherlands.

Preparation of a gelled soft candy (wine gums) containing 60 % SS and a ratio of DE 40 glucose syrup:DE 95 fructose syrup:sucrose of 27:13:60.

- 362.2 g of DE 40 glucose syrup and 207.8 g of DE 95 fructose syrup (components
- 20 A) are heated to about 60°C in a sauce pan. 50.0 g of iota carrageenan type X-8300 (component B) is added to the syrup while stirring with a high speed mixer.

Upon complete dispersion of the carrageenan 870.6 g of water and a buffering agent in the form of 20.8 g of tri-sodium citrate (components C) are added to the slurry which is then heated to the boiling point (100°C) while stirring.

Thereafter 659.6 g of sucrose (component D) is added to the slurry which is then boiled (100°C) while stirring to adjust the content of soluble solids to 60% by weight by evaporation of water.

To this slurry 40.0 g of 50% w/v citric acid (component E) is added in order to
5 obtain a pH of about 3.8 while stirring to obtain a total of 2 kg of final slurry.

The slurry is then poured into a hot depository funnel and filled into moulds. After depositing for about one hour a soft candy with a firm and chewy texture is obtained. The depositing temperature of the individual samples is noted. The average depositing temperature of slurry 1.1 is presented in table VI together with the texture of the
10 deposited slurries, as well as their pH and content of soluble solids tested according to the measurement methods given below.

Examples 1.2 to 4.4

Table I provides a recipe for preparing the soft candies according to examples 1.2 to 4.4. The amount of each ingredient used in the preparation of these are given in
15 grams per 100 grams of final slurry. The method of preparation is performed analogously to Ex. 1.1.

Table I

Ingredients added in the preparation of soft candies (wine gums) according to the examples 1.1 to 4.4

Component	Ingredients	%SS	Ex. 1.1		Ex. 1.2	
			(g)	(g) SS	(g)	(g) SS
A	40 DE syrup	84	18.11	15.21	21.37	17.95
	95 DE fructose syrup	70	10.39	7.27	12.26	8.58
B	GENUTINE™ type X-8300 carrageenan	100	2.50	2.5	2.50	2.5
C	Water 1:1	0	43.53	0	32.44	0
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04
D	Sucrose	100	32.98	32.98	38.93	38.93
E	Citric acid 50% w/v	50	2.00	1	2.00	1
	Evaporation		10.54		10.54	
	Yield		100		100	
	Yield soluble solids			60		70

Table I (cont.)

Component	Ingredients	%SS	Ex. 2.1		Ex. 2.2	
			(g)	(g) SS	(g)	(g) SS
	60 DE glucose syrup	80	55.13	44.1	65.06	52.05
B	GENUTINE™ type X-8300 carrageenan	100	2.50	2.5	2.50	2.5
C	Water 1:1	0	38.52	0	26.53	0
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04
D	Sucrose	100	11.36	11.36	13.41	13.41
E	Citric acid 50% w/v	50	2.00	1	2.00	1
	Evaporation		10.54		10.54	
	Yield		100		100	
	Yield soluble solids			60		70

Table I (cont.)

Component	Ingredients	%SS	Ex. 3.1		Ex. 3.2		Ex. 3.3	
			(g)	(g) SS	(g)	(g) SS	(g)	(g) SS
A	95 DE fructose syrup	70	63.00	44.1	74.36	52.05	85.71	60
B	GENUTINE™ type X-8300 carrageenan	100	2.50	2.5	2.50	2.5	2.50	2.5
C	Water 1:1	0	30.64	0	17.23	0	3.83	0
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04	1.04	1.04
D	Sucrose	100	11.36	11.36	13.41	13.41	15.46	15.46
E	Citric acid 50% w/v	50	2.00	1	2.00	1	2.00	1
	Evaporation		10.54		10.54		10.54	
	Yield		100		100		100	
	Yield soluble solids			60		70		80

Table I (cont.)

Component	Ingredients	%SS	Ex. 4.1		Ex. 4.2		Ex. 4.3		Ex. 4.4	
			(g)	(g) SS	(g)	(g) SS	(g)	(g) SS	(g)	(g) SS
A	60 DE glucose syrup	80	56.61	45.29	66.55	53.24	76.49	61.19	81.46	65.17
B	GENUGEL™ type WR-713 carrageenan	100	1.00	1	1.00	1	1.00	1	1.00	1
C	Water 1:1	0	38.22	0	26.23	0	14.24	0	8.25	0
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
D	Sucrose	100	11.67	11.67	13.72	13.72	15.77	15.77	16.79	16.79
E	Citric acid 50% w/v	50	2.00	1	2.00	1	2.00	1	2.00	1
	Evaporation		10.54		10.54		10.54		10.54	
	Yield		100		100		100		100	
	Yield soluble solids			60		70		80		85

Example 6.1Preparation of an aerated food composition (marshmallows)

Aerated confectioneries (marshmallows) were produced according to the following table:

5

Table III

Component	Ingredients	% SS	(g)	(g) SS
A	Water	-	16.00	-
	Sucrose	100	46.00	46.00
	Glucose syrup (DE-39)	84	18.00	15.12
	Invert syrup	75	19.00	14.25
B	Water	-	13.50	-
	GENUTINE™ type X-8300	100	1.12	1.12
	GENU™ Agar type 900-A1	100	0.45	0.45
C	Water	-	6.50	-
	Icing sugar	100	3.00	3.00
	Hyfoama™ DSN	100	0.40	0.40
D	Flavour and colour	-	Optional	
	Evaporation		23.97	
	Yield		100.00	
	Yield soluble solids			80.34

10

A sugar syrup is prepared by mixing the components (A) and heating to the boiling point. Separately a dispersion of carrageenan and a further hydrocolloid in the form of GENU™ type 900-A1 agar is dispersed in 90° C water (Component B) while stirring with a high speed mixer for two minutes. Component (B) is added to component (A) and boiled to 86% of soluble solids. Separately therefrom the ingredients of component (C) are mixed and beaten to a stiff foam.

The mixture of component (A) and (B) is slowly added to component (C) while whipping and beating for about three minutes at high speed.

Thereupon, optional flavour and colour are added, and the slurry is deposited immediately in a hot state in a manner analogous to example 1.1.

Example 7.1

Preparation of a high sugar glazing

A high sugar glazing was produced according to the following table.

Table IV

Component	Ingredients	% SS	(g)	(g) SS
A	GENUGEL™ type X-8605 carrageenan	100	0.4	0.4
	Sucrose	100	4.0	4.0
	Tri-sodium citrate	100	0.6	0.6
B	Water	-	18.0	-
C	Sucrose	100	20.0	20.0
D	Glucose syrup**	80	60.0	48.0
E	Potassium sorbate 20% w/v	20	0.5	0.1
F	Citric acid 50% w/v	50	1.4	0.7
	Evaporation		4.9	
	Yield		100.0	
	Yield soluble solids			74.0

** Cerestar FT 01700.

- 10 The ingredients of Component (A) are dry-blended and dispersed in component (B) and heated to boiling to dissolve the carrageenan. Component (C) is added while heating, whereupon Component (D) is mixed thereto under continued heating. The heating is continued to obtain a soluble solids content in the range of 73 to 75%, whereupon Component (E) as a preservative and Component (F) as a buffer is added.
- 15 The composition is deposited as disclosed in example 1.1.

The texture of the above food composition is short, creamy and very transparent. It can be melted without dilution by heating to 60 to 70° C. However, it may also be diluted by about 20% of water to obtain a glazing suitable for fruit and ice cream tarts.

Table V

Component	Ingredients	Ex. 7.2			Ex. 7.3			Ex. 7.4		
		% SS	(g)	(g) SS	% SS	(g)	(g) SS	% SS	(g)	(g) SS
A	GENUGEL™ type X-8605	100	0.4	0.4	100	0.4	0.4	100	0.4	0.4
	carrageenan									
	Sucrose	100	4.0	4.0	100	4.0	4.0	100	4.0	4.0
	Tri-sodium citrate	100	0.6	0.6	100	0.6	0.6	100	0.6	0.6
B	Water	-	20.0	-	-	17.0	-	-	15.0	-
C	Sucrose	10.0	17.0	17.0	100	22.0	22.0	100	27.0	27.0
	Glucose syrup*	80	60.0	48.0	80	60.0	48.0	80	60.0	48.0
	Citric acid 50% w/v	50	1.4	0.7	50	1.4	0.7	50	1.4	0.7
D	Evaporation		3.4			5.4			8.4	
	Yield		100.0			100			100	
	Yield soluble solids		70.7				75.7			80.7

* CERESTAR FT 01700

The texture of the products of ex. 7.2 to 7.4 is pleasantly soft, creamy and short.

Test results of the above compositions appear from the table VII below.

Experimental results

Measurement methods:

- 5 Texture, pH and content of soluble solids are determined as follows:

Texture

- The textures of the deposited samples are characterised by the following parameters:
Break strength (BS) (in grams of force), at 5°C, Gel strength (in grams of force), at 5°C at a 2 mm, 4mm, and 8 mm compression distance, and Distance to break (DT) at 5° C; which parameters are measured with a Texture Analyzer on test samples deposited in Bloom glasses.
- 10

Bloom glasses: Pyrex™ glass cylinders of a diameter of 700 mm and a height of 40 mm, available from Bibby Sterilin Ltd., Stone, Staffordshire, Great Britain.

Break strength.

- 15 The Break strength (BS) is determined as the force (in grams) required to compress the sample to break with a 0.5" (1.25 cm) diameter probe.

Gel strength.

The Gel strength is determined as the force (in grams) required to compress the gel 2, 4, and 8 mm, respectively, with a 0.5" (1.25 cm) diameter probe.

Distance to break.

The Distance to-break (DT, Distance Travelled) is determined as the distance (in mm) it takes to break the gel.

In these experiments the probe speed is 1 mm/sec.

5 *Refractometer.*

Part of the gel from one of the Bloom glasses is used for measurement of soluble solids in a refractometer, available from Bellingham & Stanley Ltd., Great Britain, covering the range 40 to 80% SS or 75 to 93% SS.

Depositing temperature.

- 10 Said temperature is measured with a thermometer placed in the centre of a depository funnel. The depositing temperature is read as the temperature just before the material is non-flowable.

Gelation temperature.

- 15 The gelation temperature, T_{gel} , is the temperature at which the gel-forming process initiates. It is determined as the intersection of the graphs of elastic modulus, G' , and viscous modulus, G'' , respectively.

Rheological measurements: Rheological measurements to determine the elastic modulus, G' , the viscous modulus, G'' , as well as the viscosity versus temperature were performed using a Haake Rheometer, RS100, Rheostress, Haake, Germany.

- 20 Measurements were performed using the following settings:

-Gradient 1°C/min, 0,4640 Hz

95°C-65°C, $t=1800$ s, 0,50 Pa

65°C-35°C, $t=1800$ s, 2,50 Pa

-Stress sweep 35°C

0,10 Pa-20;00 Pa, 0,4640 Hz

Springiness.

Springiness is a measure of the ability of the sample to regain its original shape after
 5 compression. The sample is placed under a cylinder probe, avoiding any irregular or
 non-representative areas. The probe then compresses the sample until it has com-
 pressed 20% of the product height. The probe holds this position for 60 seconds and
 then withdraws from the sample and returns to its starting position. The force on the
 probe after 60 seconds at the 20%-position is recorded (F 60). % springiness is
 10 calculated from the expression:

$$\% \text{ springiness} = \frac{F_{60}}{F_0} \times 100\%$$

wherein F_0 is the force measured after 0 seconds.

Test results for examples 1.1 to 4.4 and 7.2 to 7.4 appear from the below Tables VI
 15 and VII, respectively.

Table VI

Test results for examples 1.1 to 4.4, soft candies (wine gums)

		Ex. 1.1	Ex. 1.2	Ex. 2.1	Ex. 2.2
% SS (calculated)		60	70	60	70
Sucrose:Non sucrose		60:40	60:40	20:80	20:80
DE of non sucrose		~DE 60	~DE 60	DE 60	DE 60
TA.XT2 measurements in Bloom glasses					
Gel strength	2 mm (g)	6.7	6.8	6.0	6.9
	4 mm (g)	15.3	16.2	14.1	16.3
	8 mm (g)	40.0	41.2	37.2	41.0
BS (g)		739	873	660	830
DT (mm)		29.6	29.8	29.3	30.0
Depositing temperature (°C)		74-76	84-86	76-78	84-86
pH		3.8	3.8	3.8	3.9
% SS (measured)		60.0	70.0	60.0	67.0

Table VI (cont.)

TAXT2 measurements in Bloom glasses									
	Ex. 3.1	Ex. 3.2	Ex. 3.3	Ex. 4.1	Ex. 4.2	Ex. 4.3	Ex. 4.4		
% SS (calculated)	60	70	80	60	70	80	85		
Sucrose:Non sucrose	20:80	20:80	20:80	20:80	20:80	20:80	20:80		
DE of non sucrose	DE 95	DE 95	DE 95	DE 60	DE 60	DE 60	DE 60		
TAXT2 measurements in Bloom glasses									
Gel strength	2 mm (g)	9.3	8.1	8.8	298	347	194	118	
	4 mm (g)	18.8	17.6	19.2	623	706	546	379	
	8 mm (g)	44.1	42.8	45.2	254	395	1335	1234	
BS (g)	453	555	714	417	534	1403	2140		
DT (mm)	26.4	27.1	30.0	27.4	29.2	9.1	14.1		
Depositing temperature (°C)	67-69	74-76	86-88	53	63	86	76		
pH	3.8	3.8	3.7	3.9	4.0	4.0	4.0		
% SS (measured)	57.0	68.0	79.0	65.0	68.0	79.0	83.0		

Table VII

Test results for examples 7.2 to 7.4, glazings

		Ex. 7.2	Ex. 7.3	Ex. 7.4
% SS		70.7	75.7	80.7
Sucrose:Non sucrose		30:70	35:65	40:60
DE of non sucrose		62	62	62
TA.XT2 measurements in Bloom glasses				
Gel strength	2 mm (g)	93	93	35
	4 mm (g)	185	238	112
	8 mm (g)	181	239	333
BS (g)		274	347	444

Example 8

- 10 Further test results were obtained, in which gelled soft candies (wine gums) were prepared essentially as described in the above examples 1.1. to 4.4, using GENUTINE™ X-9303 carrageenan at a fixed amount of 2.5 %, but varying the weight ratios of sucrose and non-sucrose sweeteners, the DE values of the non sucrose sweetener, and the % SS values.
- 15 The characteristics of the different preparations were then determined, and the test results are listed in Table VIII below. Also, the corresponding data (G' , G'' , and viscosity) are shown in Figs 1.1 to 1.9.

Viscosity (mPa's), elastic modulus G' (Pa), and viscous modulus G'' (Pa) were plotted as a function of the temperature in Figs 1.1-1.9. The data were obtained,

using a Haake rheometer.

The gelation temperature of each composition is read from each of the Figs 1.1 to 1.9 as the temperature at which the respective G' curve and the G'' curve intersects.

All the compositions tested resulted in gelation temperatures below 95° C, water activities above 0.65 and springiness values above 30 (Table VIII).

Table VIII

Ex. No	Use level	Carrageenan	Gelation temp. (°C)	Deposit temp.	Viscosity at 95°C	Syrup: sugar	Syrup type	DE	% Soluble solids	Aw	Springiness %
8.1	2.5	GENUTINE™ X-9303	81.1	75	2788	4:1	HM 70	DE 54	79(81)	0.705	48.1
8.2	2.5	GENUTINE™ X-9303	71.3	71	1455	2:1	HM 70	DE 54	76		49.4
8.3	2.5	GENUTINE™ X-9303	80.0	76	3293	2:1	Igos	DE 40	76		44
8.4	2.5	GENUTINE™ X-9303	74.2	70	974	2:1	Igos	DE 40	74		
8.5	2.5	GENUTINE™ X-9303	73.5	71	796	2:1	HM 70	DE 54	73		
8.6	2.5	GENUTINE™ X-9303	89.7	87	9699	4:1	Igos	DE 40	79.5	0.711	38.7
8.7	2.5	GENUTINE™ X-9303	78.3	80	2019	4:1	HM 70	DE 54	76	0.724	41.2
8.8	2.5	GENUTINE™ X-9303	85.5	81	3862	5:95	HM 70	DE 54	78.5	0.673	31.1
8.9	2.5	GENUTINE™ X-9303	81.4	77	3212	100:0	HM 70	DE 54	79	0.718	52.6

it appears, all formulations tested gave satisfactory results in terms of gelation temperatures well below 95°C, and a springiness in the order 40-50 %.

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Example 9

US 5,607,716 discloses a low fat confectionery gelled by the use of carrageenan. The confectionery according to US 5,607,716, however, does not possess the desired characteristics according to the present invention in terms of gelation temperature, ease of
5 handling, and springiness.

In order to further verify this, tests were performed comparing compositions prepared according to the recipes of examples 6 and 8 of the US 5,607,716 patent.

The type of carrageenan used in this comparative test was GENUTINE™ X-9303 and the results are shown in table X and Fig 2 below, wherefrom the gelation temperature
10 (intersection point of the G' and G'' curves) is obtained.

The compositions were:

- I. Composition prepared according to example 6 of US 5,607,716, however using 0.2% GENUTINE™ X-9303, and 87% SS.
- II. Composition prepared according to example 8 of US 5,607,716, however using
15 0.6% GENUTINE™ X-9303, and 89% SS.
- III. Composition prepared according to example 6 of US 5,607,716, increasing the amount of GENUTINE™ X-9303 to 2.5%, the amount presently preferred according to the present invention, and reducing the SS content to 75%.
- IV. Composition prepared according to example 8 of US 5,607,716, increasing the
20 amount of GENUTINE™ X-9303 to 2.5% and reducing the SS content to 75%.
- V. Composition prepared according to the present invention containing 2.5%

GENUTINE™ X-9303, 79% SS, a sucrose:non sucrose ratio of 1:4, and a DE 54 of the non-sucrose sweetener.

VI. Composition prepared as in V with 5% evaporated skim milk added.

For details on the composition, see Table IX below. The results obtained are given in

5 Table X.

Tabel IX

10	Ingredients / Sample	I	II	III	V	VI
	Evaporated Skim Milk	36.55	34.86	31.71		6.39
	Di-sodium phosphate	0.06	0.01	0.06		
	Tri-sodium citrate				0.46	0.46
	High Fructose syrup, 55% fructose	61.04	58.24	52.98		
	High Maltose syrup, Cargill HM70				68.81	63.25
15	Sugar				13.76	13.80
	Butter		4.00			
	Butter flavour	0.15		0.15		
	AVICEL GP 3252	1.00	1.00	1.00		
	Water		0.30	10.60	13.76	13.80
20	GENUTINE™ X-9303	0.20	0.60	2.50	2.29	2.30
	NaCl	0.50	0.50	0.50		
	Lecithin	0.20	0.19	0.20		
	K-2000 (mono- and diglycerides)	0.30	0.30	0.30		
25	Citric acid (50% w/v solution)				0.92	
	Total	100.00	100.00	100.00	100.00	100.00

Table X

Composi- tion	Appearance	Deposition- able	Gelation temp. (° C)	Viscosity at 95° C	Springiness
I	Thick, uneven	Yes	> 95	~ 20.000	< 10
II	Very thick, uneven	No	> 95	~ 100.000	< 15
III	Thick, very uneven, inhomoge- neous	No	> 95	> 100.000	28
*IV	-	-	-	-	-
V	Thin, even, homoge- neous	Yes	81	~ 2.800	48
VI	Even, homoge- neous	Yes	90	~ 10.000	35

10 *This composition was not possible to make.

This test shows (Table X) that the recipe given in Examples 6 and 8 of US 5,607,716 will not result in a composition with the desired gelation temperature below 95° C, neither if the carrageenan is used in 0.2 to 0.6% amounts (see I and II), nor if the amount is increased to 2.5% (see III and IV). Only the sweetening system used accord-
 15 ing to this invention (see V and VI) will result in a product with the desired characteris-
 tics.

It is evident from the above results that the composition according to the invention (V) has the desired gelation temperature below 95° C, is easier to work with and has more springy characteristics.

The above description of the invention reveals that it is obvious that it can be varied in many ways. Such variations are not to be considered a deviation from the scope of the invention, and all such modifications which are obvious to persons skilled in the art are also to be considered comprised by the scope of the succeeding claims.

Claims

1. A food composition comprising soluble solids in the range of about 50% to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE (Dextrose Equivalent) of at least about 30; a carrageenan component in an amount sufficient to form a gel, and water to balance, and wherein the gelation temperature, determined as the intersection of the graphs of elastic modulus, G' , and viscous modulus, G'' , measured on a Haake Rheometer, RS 100 using the settings - Gradient $1^{\circ}\text{C}/\text{min}$, 0,4640 Hz, $95^{\circ}\text{C} - 65^{\circ}\text{C}$, $t=1800\text{ s}$, 0,50 Pa, $65^{\circ}\text{C} - 35^{\circ}\text{C}$, $t=1800\text{ s}$, 2,50 Pa - Stress sweep 35°C 0,10 Pa- 20,00 Pa, 0,4640 Hz, of said food composition is $< 95^{\circ}\text{C}$.
2. The composition according to claim 1, wherein said non sucrose sweetener is a hydrogenated starch hydrolysate syrup of a DE of at least about 30, preferably a DE > 30 fructose or glucose syrup.
3. The composition according to claim 1, wherein said non sucrose sweetener is a hydrogenated starch hydrolysate syrup of a DE of least about 40, preferably a DE > 40 fructose or glucose syrup.
4. The composition according to claim 1, wherein said non sucrose sweetener is a hydrogenated starch hydrolysate syrup with a DE in the range of about 40 to about 100, particularly preferred about 50 to 90, especially about 60 to 70.
5. The composition according to claim 4, wherein said non sucrose sweetener is a high maltose glucose syrup, particularly a high maltose glucose syrup of a DE of about 50 to 60.

6. The composition according to claim 1, wherein the sucrose can be replaced wholly or partly by an aqueous solution of a sugar alcohol.
7. The composition according to claim 6, wherein said sugar alcohol is selected among sorbitol, mannitol, xylitol, isomalt, lactitol, maltitol or a maltitol syrup.
- 5 8. The composition according to any one of the claims 1 to 7, wherein the ratio of sucrose to non sucrose sweetener is from about 10:90 to about 70:30, preferably from about 20:80 to about 30:70, particularly preferred about 1:2.
9. The composition according to claim 1, wherein the soluble solids thereof is in the range of 70 to 85 % by weight, particularly preferred about 75 to 80 % by weight.
- 10 10. The composition according to claim 1, wherein the gelation temperature of said food composition is less than 85° C, preferably less than 80° C.
11. The food composition according to claim 1, wherein at least about 80 %, preferably at least about 90 % of the soluble solids are comprised by said sweetening system.
- 15 12. The composition according to claim 1, wherein said carrageenan component is an iota carrageenan or a kappa carrageenan or mixtures thereof.
13. The composition according to claim 12, wherein said carrageenan is present in an amount of about 0.25 to 10.0% by weight, preferably about 0.75 to 5.0%, especially about 1 to 3% by weight of the food composition.
- 20 14. The composition according to claim 1 further comprising as additional gelling agent a hydrocolloid selected from the group comprising pectin, agar-agar, alginates, carboxy methyl cellulose, methyl cellulose, hydroxy propyl cellulose,

curdlan, xanthans, gelatine, starch and gum arabic in an amount of up to about 10.0% by weight of the food composition.

15. The composition according to claim 1, wherein said soluble solids further comprise one or more ingredients selected among milk solids, vitamins, minerals,
5 food grade acids and salts thereof, flavourings, colourings, artificial sweeteners, preservatives and bulking agents.
16. The composition according to claim 1, wherein said food composition is a high sugar confectionery.
17. The composition according to claim 16, wherein said food composition
10 is soft candies or wine gum.
18. The composition according to claim 1, wherein said composition is an aerated confectionery and further comprises a whipping agent.
19. The composition according to claim 1, wherein said composition is a glazing.
- 15 20. A process for producing a food composition according to claim 1 comprising (a) dispersing carrageenan in a syrup of a non sucrose sweetener at a temperature sufficient to disperse the carrageenan in said syrup while stirring, (b) adding water and heating the mixture to the boiling point thereof, (c) adjusting the soluble solids content to from about 50% to about 90% by weight, (d) depositing said mixture and
20 (e) cooling said mixture to below the depositing temperature of said mixture.
21. The process according to claim 20, wherein sucrose, if any, is added in step (c).

22. The process according to any one of the claims 20 to 21, wherein the temperature sufficient to disperse the carrageenan in the syrup of the non sucrose sweetener is at least about 50, especially at least about 60° C.

23. The process of any one of the claims 20 to 22, wherein one or more ingredients selected among milk solids, vitamins, minerals, food grade acids, flavourings, colourings, artificial sweeteners, preservatives and bulking agents is (are) added between steps (c) and (d).

24. The process according to any one of the claims 20 to 23, wherein in step (d) said hot mixture is deposited in moulds.

25. A use of a carrageenan component for gelling a food composition of a soluble solids content of about 50 to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE of at least about 30, and wherein the gelation temperature of said food composition, determined as the intersection of the graphs of elastic modulus, G' , and viscous modulus, G'' , measured on a Haake Rheometer, RS 100 using the settings - Gradient 1°C/min, 0,4640 Hz, 95°C - 65°C, $t=1800$ s, 0,50 Pa, 65°C - 35°C, $t=1800$ s, 2,50 Pa - Stress sweep 35 °C 0,10 Pa- 20,00 Pa, 0,4640 Hz, is < 95° C.

26. The use according to claim 25, wherein said carrageenan is an iota carrageenan or a kappa carrageenan or mixtures thereof.

Abstract

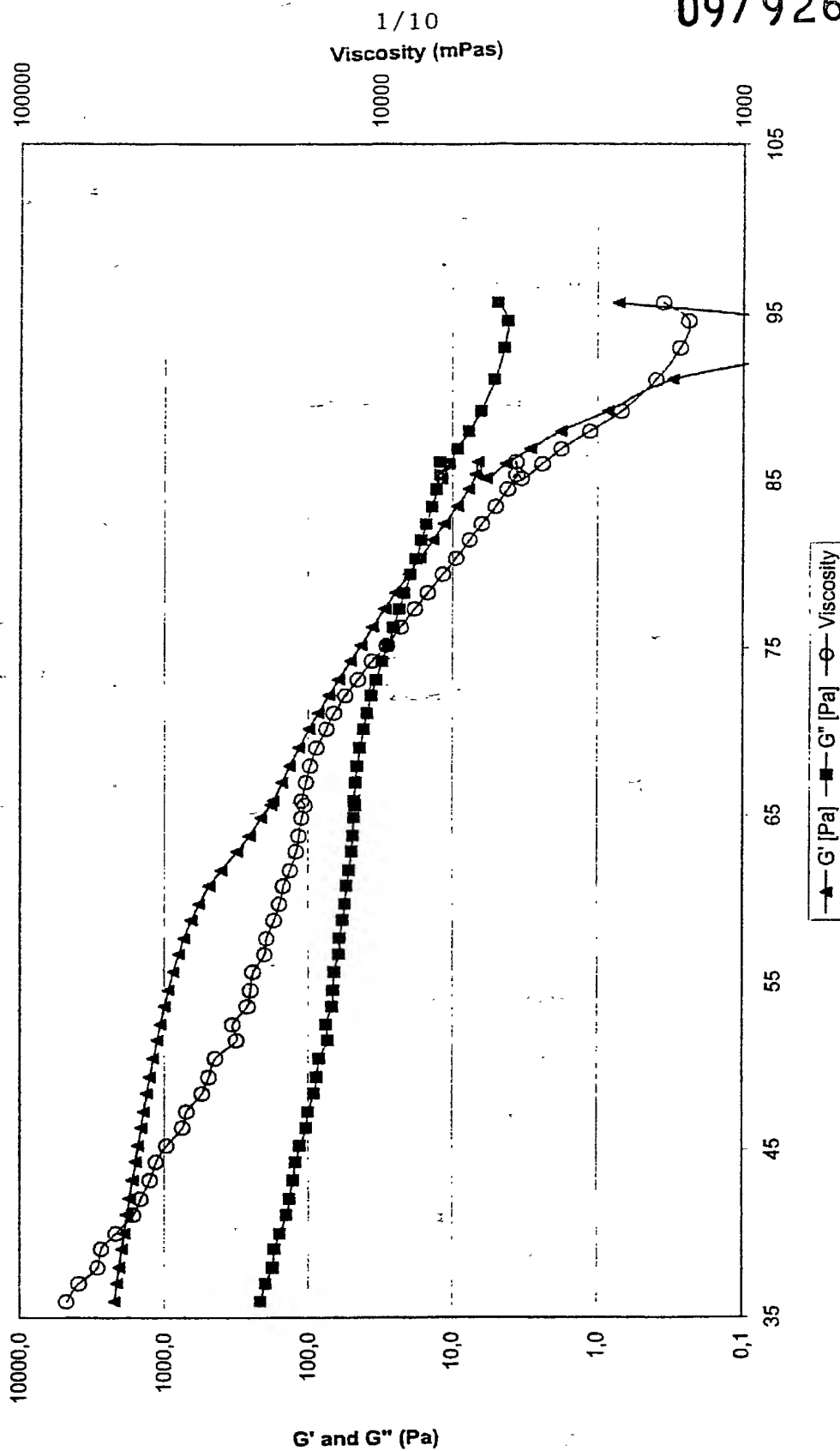
A food composition comprising soluble solids in the range of about 50% to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 5 0:100 to 95:5, wherein the non sucrose sweetener is of a DE (Dextrose Equivalent) of at least about 30, a carrageenan component in an amount sufficient to form a gel, and water to balance, and wherein the gelation temperature of said composition is $< 95^{\circ}\text{C}$.

Said food composition may be produced by a process comprising (a) dispersing carrageenan in a syrup of a non sucrose sweetener at a temperature sufficient to disperse 10 the carrageenan in said syrup while stirring, (b) adding water and heating the mixture to the boiling point thereof, (c) adjusting the soluble solids content to from about 50% to about 90% by weight, (d) depositing said mixture and (e) cooling said mixture to below the depositing temperature of said mixture.

The food composition gels rapidly and forms a gel at temperatures of below 95°C . The 15 food composition is especially confectionery products such as soft candies, marshmallows or glazings.

Fig 1.1

2.5% GENUTINE™ X-9303, 79% SS, DE 54, 4:1, pH 3.9



2/10
Viscosity (mPas)

2.5% GENUTINE™ X-9303, 76% SS, DE 54, 2:1, pH 3.9

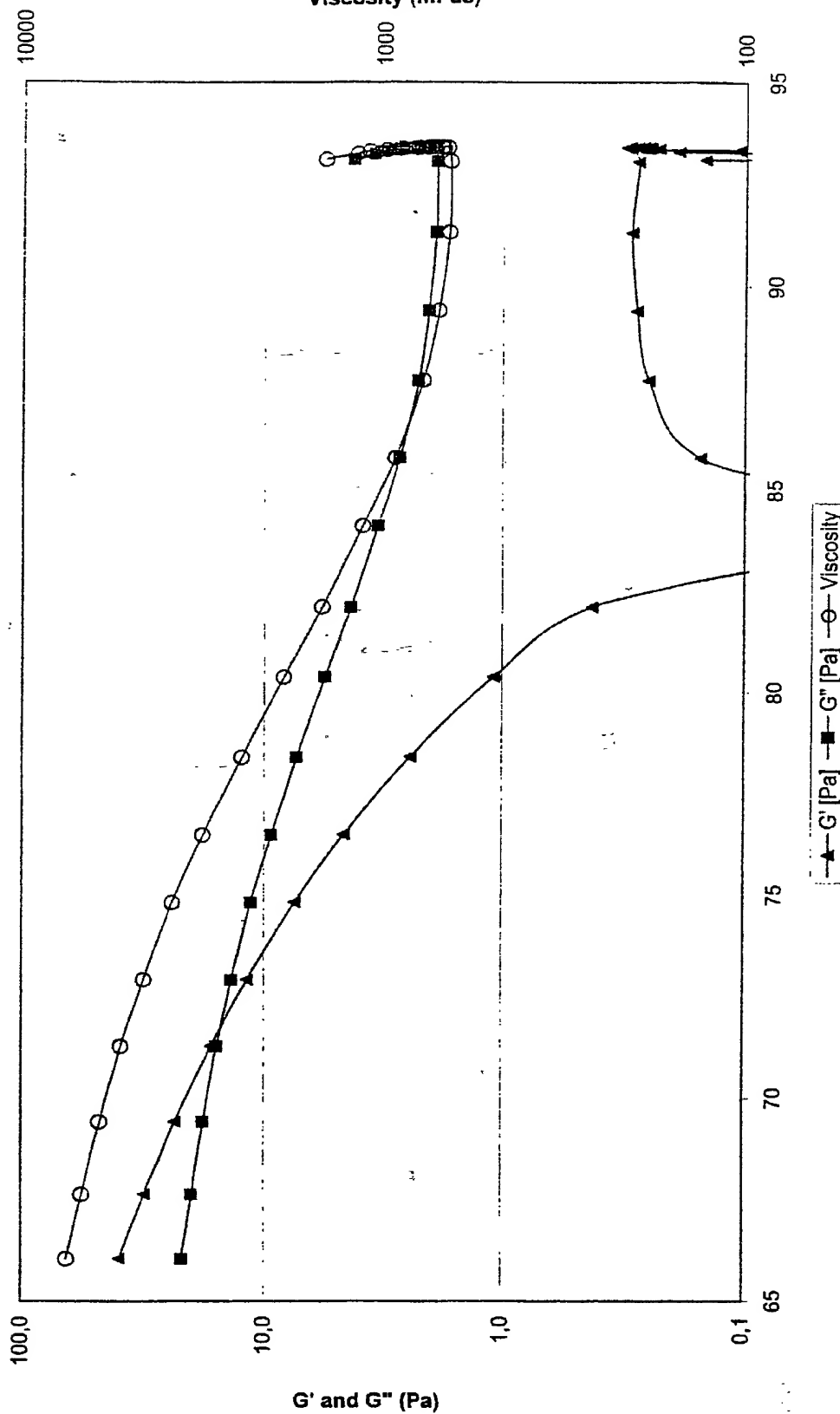


Fig 1.2

2.5% GENUTINE™ X-9303, 76%SS, DE 40, 2:1, pH 3.9

Fig 1.3

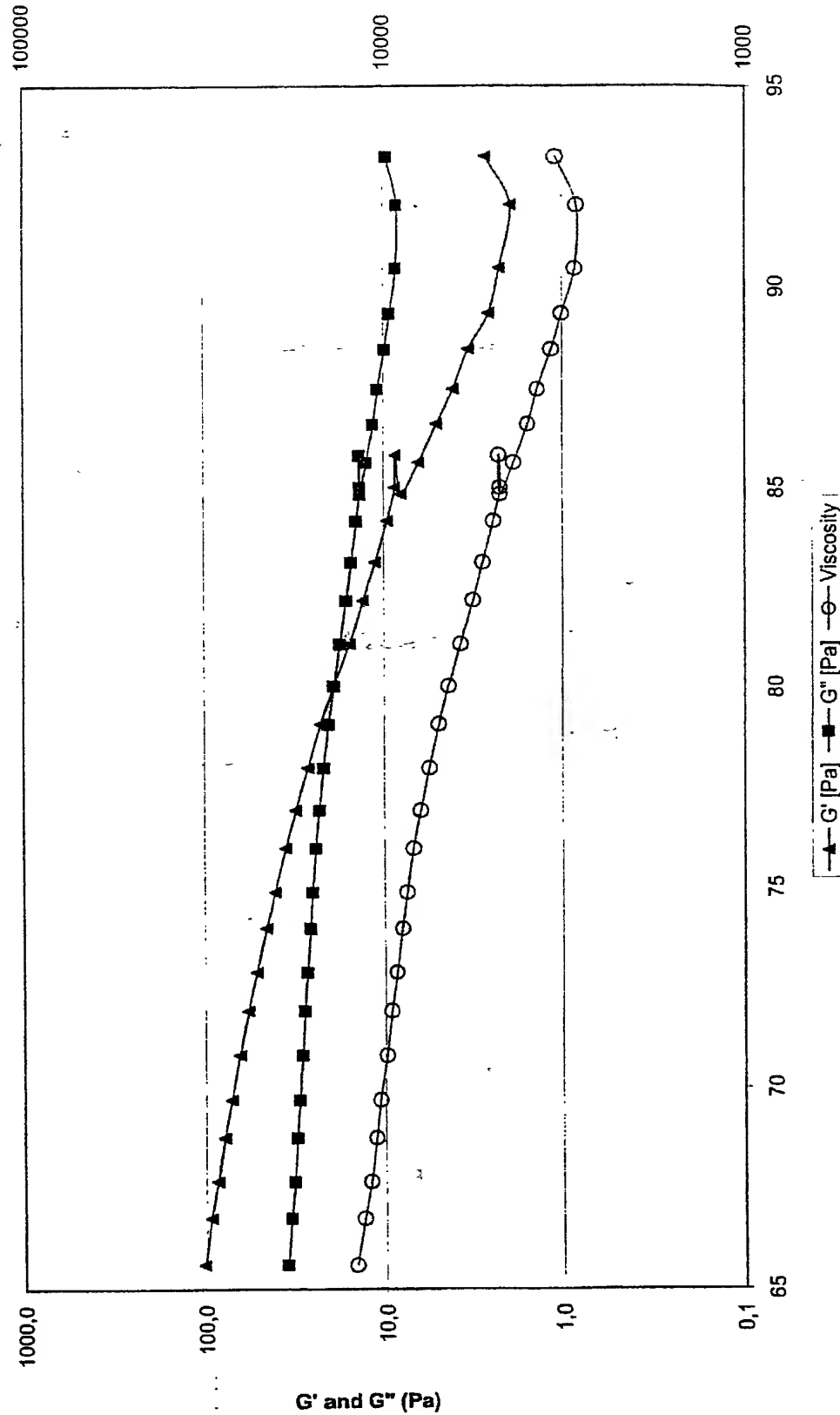
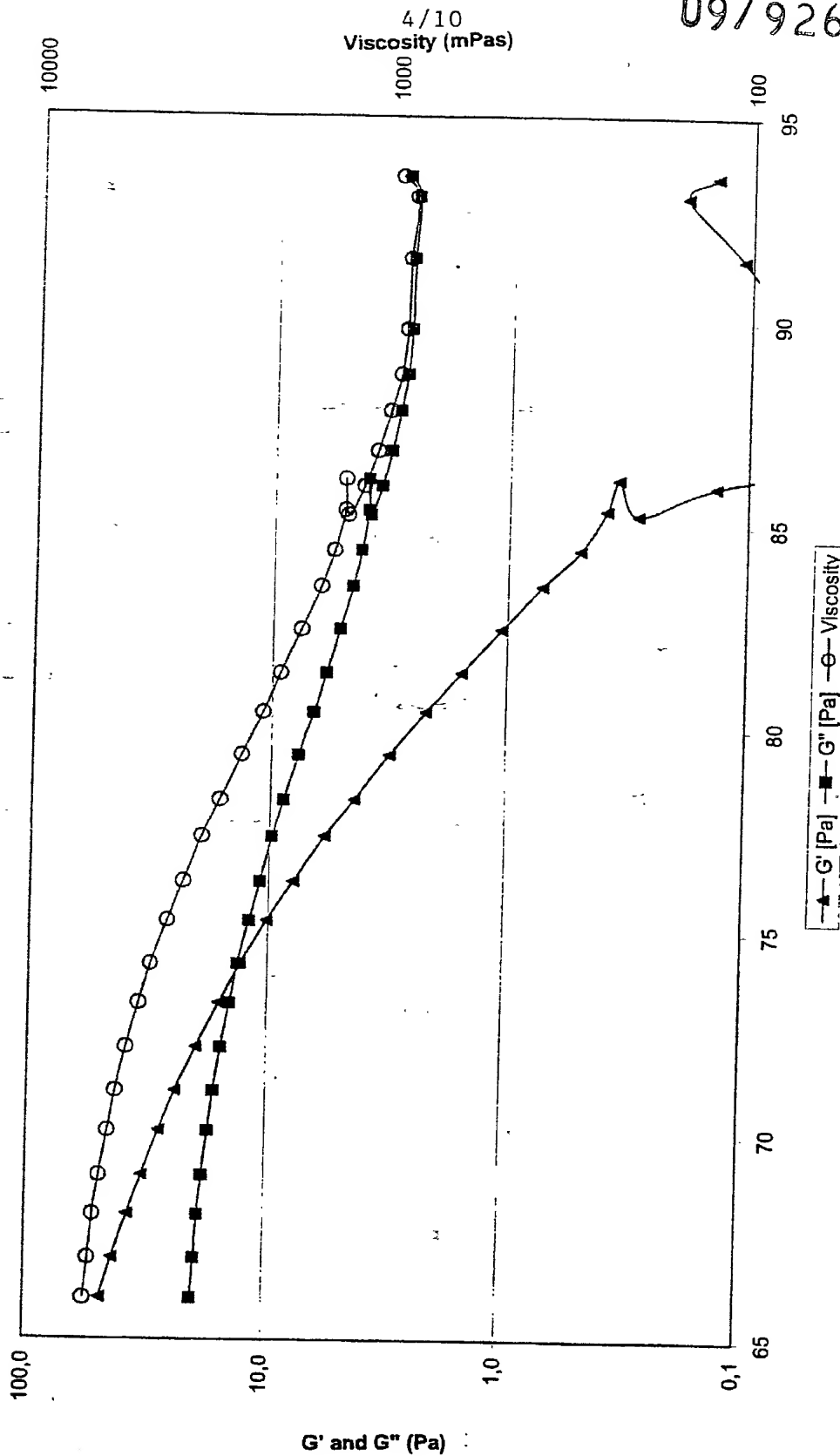


Fig 1.4

2.5% GENUTINE™ X-9303, 73%SS, DE 40, 2:1, pH 3.9



09/926475

Fig 1.5

2.5 % GENUTINE™ X-9303, 73% SS, DE 54, 2:1, pH 3.9

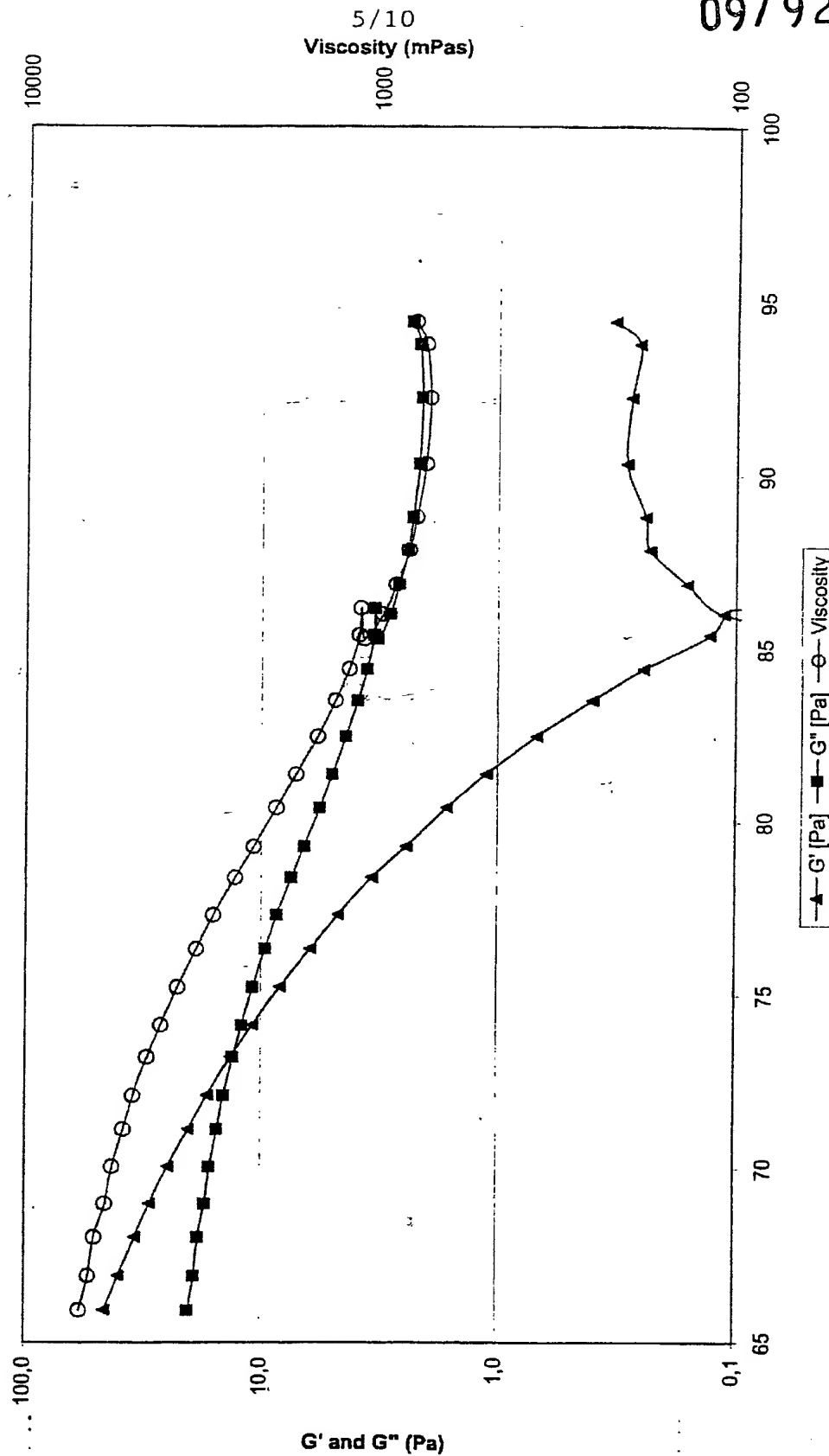
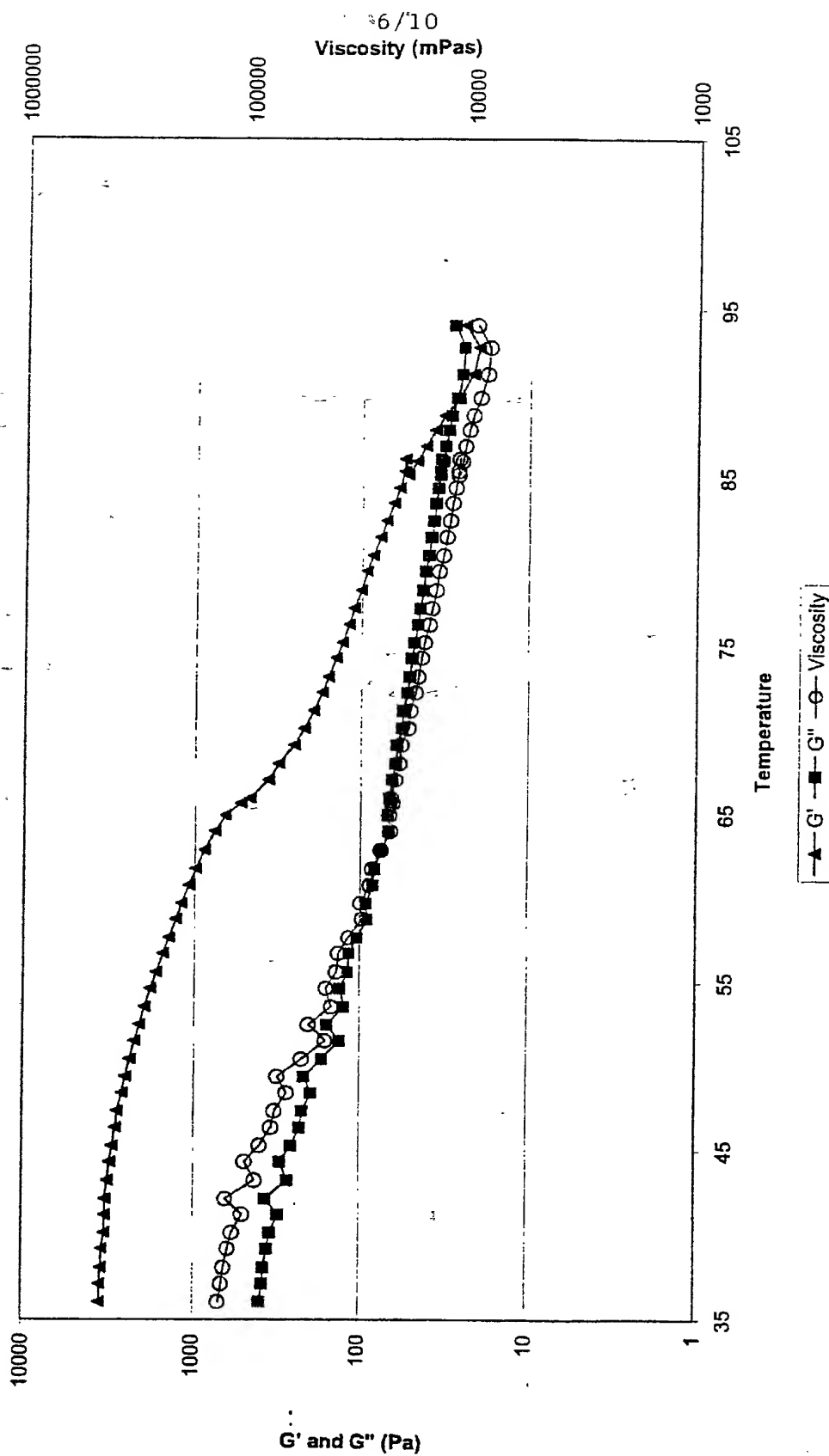


Fig 1.6

2.5% GENUTINE™ X-9303, DE 40 4:1, 79% SS, pH 3.9



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Viscosity (mPas)

2.5% GENUTINE™ X-9303, DE 54 4:1, 76% SS, pH 3.9

Fig 1.7

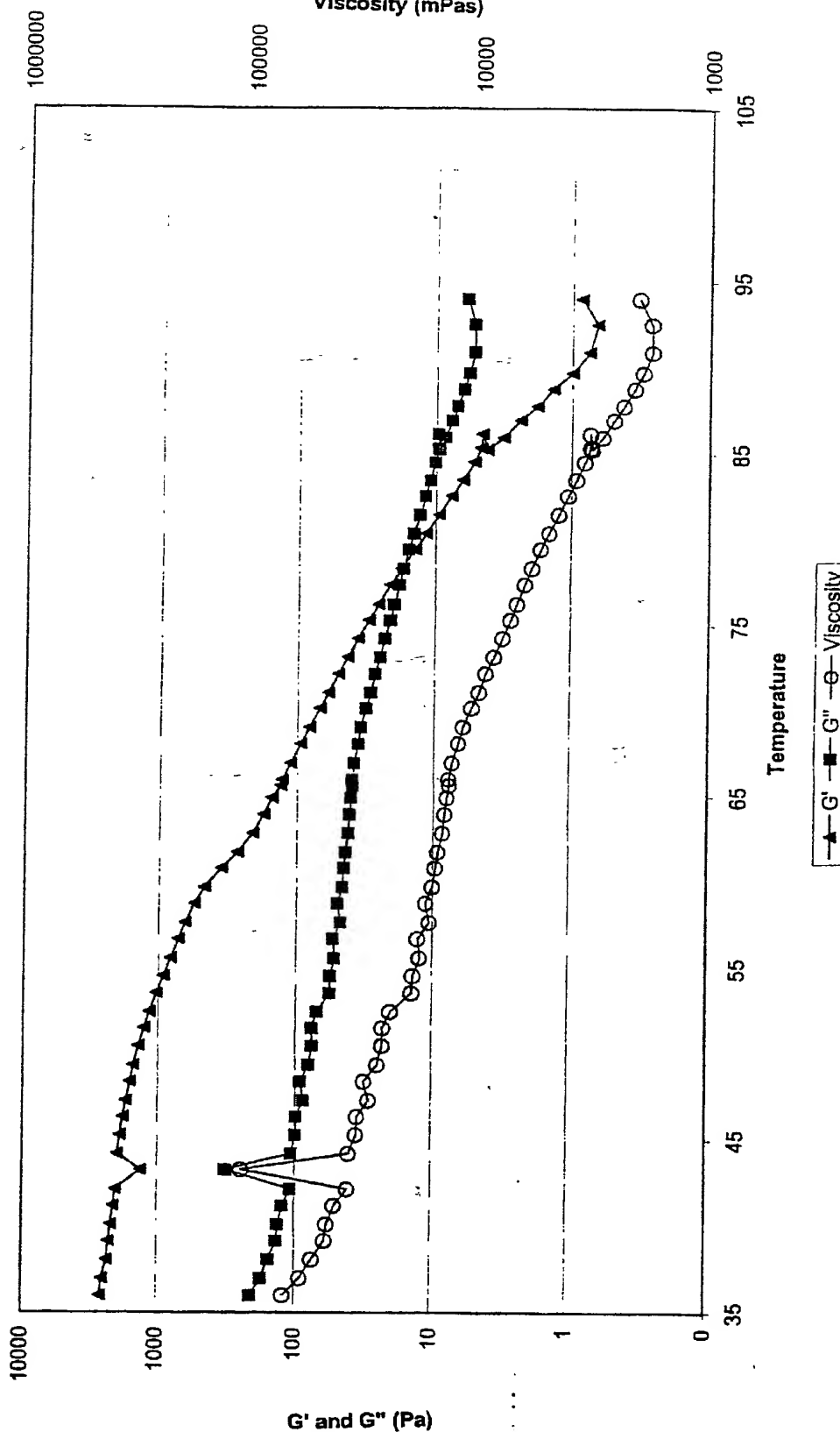
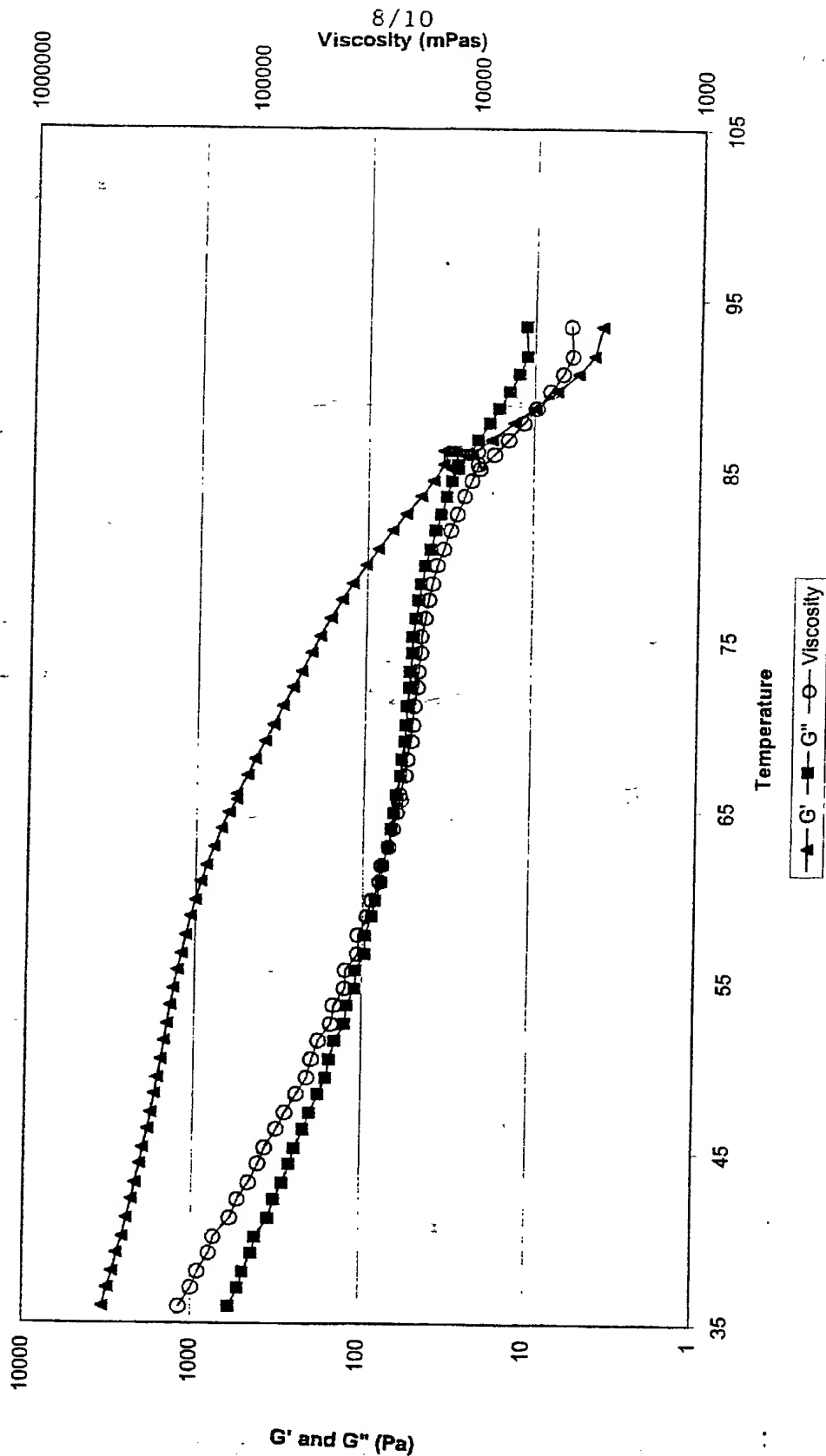


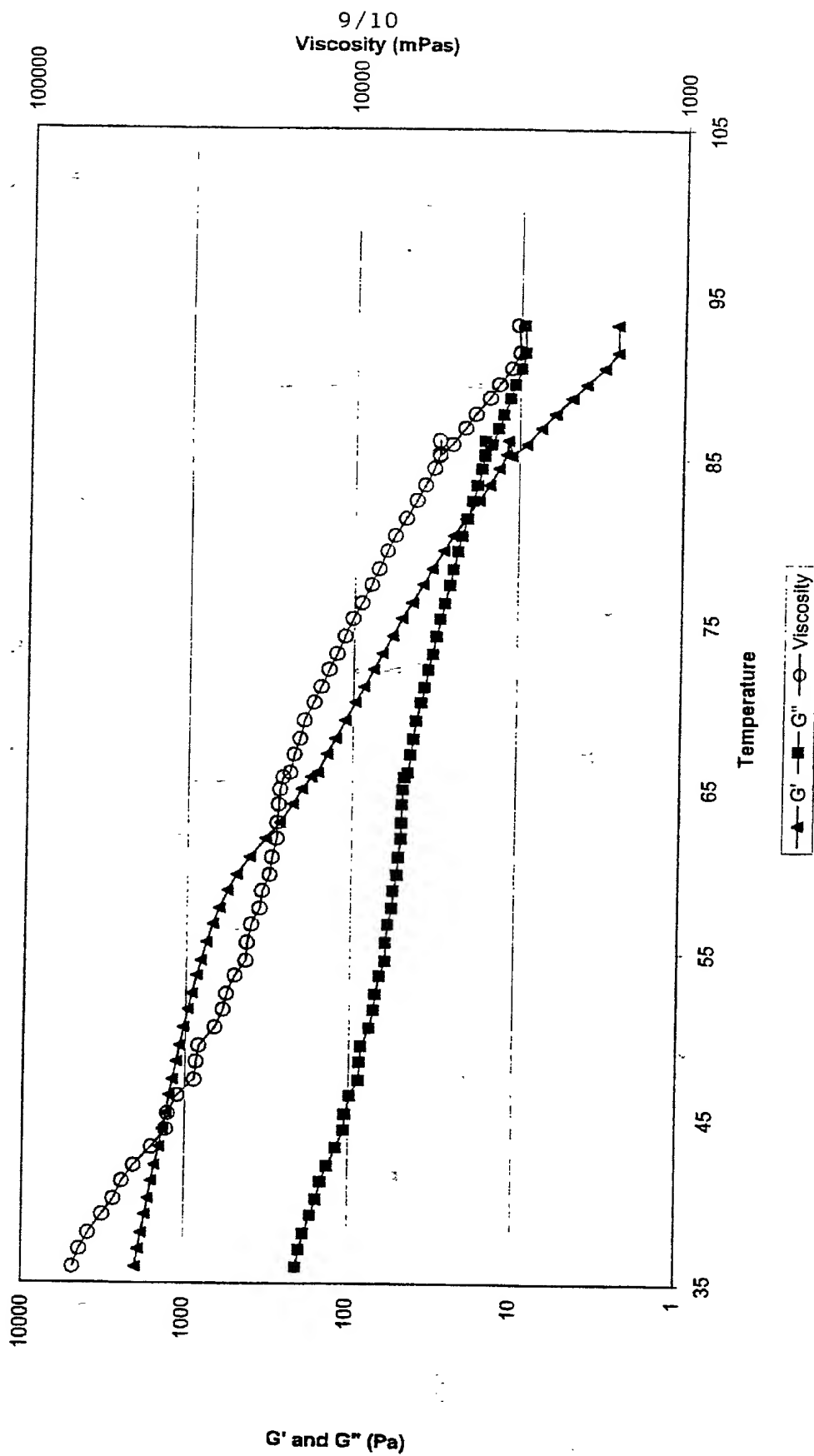
Fig 1.8

2.5% GENUTINE™ X-9303, DE 54 5:95, 79% SS, pH 3.9



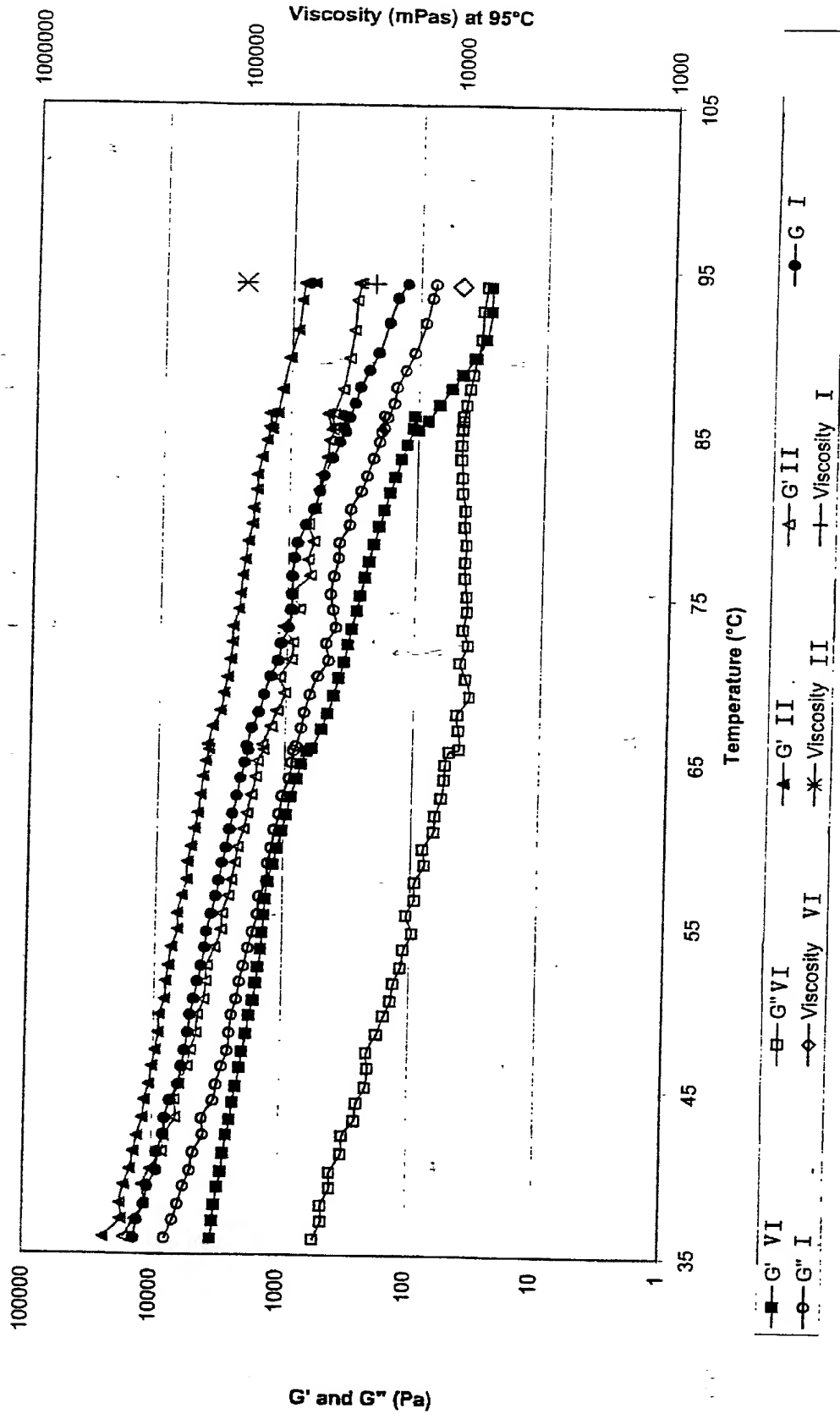
2.5% GENUFINE™ X-9303, DE 54 100%, 79% SS, pH 3.9

Fig 1.9



10/10

Fig 2



Declaration and Power of Attorney For Utility or Design Patent Application English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

FOOD COMPOSITION WITH HIGH SOLIDS CONTENT, A METHOD FOR ITS PREPARATION AS WELL AS THE USE OF CARRAGEENANS FOR GELLING A FOOD COMPOSITION

the specification of which is attached hereto unless the following box is checked:

☒ was filed on May 12, 2000 as

United States Application Number 09/926,475
and was amended on November 9, 2001 (if applicable) or,

PCT International Application Number PCT/DK00/00252
and was amended on May 7, 2001 and August 2, 2001 (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code §119 (a-d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below. I have also identified below, by checking the "No" box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed:

<u>PA 1999 00650</u>	<u>DENMARK</u>	<u>May 12, 1999</u>	Priority Claimed	
(Number)	(Country)	(Day/Month/Year Filed)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<u> </u>	<u> </u>	<u> </u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<u> </u>	<u> </u>	<u> </u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<u> </u>	<u> </u>	<u> </u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No

☐ Additional foreign application numbers are listed on a supplemental priority sheet attached hereto.

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.

<u> </u>	<u> </u>
(Number)	(Day/Month/Year Filed)
<u> </u>	<u> </u>
(Number)	(Day/Month/Year Filed)
<u> </u>	<u> </u>
(Number)	(Day/Month/Year Filed)

☐ Additional provisional application numbers are listed on a supplemental priority sheet attached hereto.

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s), or §365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

(Application No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

☐ Additional U.S. or international application numbers are listed on a supplemental priority sheet attached hereto.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

The undersigned hereby authorizes the U.S. attorney or agent named herein to accept and follow instructions from either his foreign patent agent or corporate representative, if any, as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the attorney(s) and/or agent(s) associated with the Customer Number provided below to prosecute this application and transact all business in the Patent and Trademark Office connected therewith, and direct that all correspondence be addressed to that Customer Number:

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Residence	
Citizenship	
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Full name of sixth joint inventor, if any	
Sixth Inventor's signature	Date
Residence	
Citizenship	
Post Office Address	